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EXAMINER

MALSAWMA, LALRINFAMKIM HMAR

ART UNIT PAPER NUMBER

2825

DATE MAILED: 12/05/2001

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Applicati n No.

09/902,672

Applicant(s)

FUNABASHI, MICHIMASA

Examiner

Lex Malsawma

Art Unit

2825

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 12 July 2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☒ Certified copies of the priority documents have been received in Application No. 09/392,568.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Claim Objections***

1. Claim 2 is objected to because of the following informalities:

In line 4, "solut4on" should read "solution".

### ***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 6 and 15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 6 and 15 are indefinite because it is not clear what temperature should be considered as "an ordinary temperature and a temperature nearly equal thereto". Examiner interprets the temperature to be any convenient temperature.

### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 2825

5. Claims 1-6 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohmi et al. (5,990,060) in view of Kinoshita et al. (5,158,616).

*Regarding Claims 1-6 and 8:*

Ohmi et al. disclose (in col. 2, lines 32-34; col. 8, lines 61-62; and TABLE 1) a method of manufacturing a semiconductor integrated circuit device comprising the steps of:

providing a processing solution consisting of an aqueous solution which includes hydracid fluoride salt (e.g., ammonium fluoride or tetraalkyl ammonium fluoride "TMAF"). Ohmi et al. **lack** cleaning a surface of a silicon wafer, in a sheet-by-sheet manner, in said processing solution. Kinoshita et al. **teach** it was very well known in the art to clean substrates in a sheet-by-sheet manner, and in col. 1, lines 38-49, Kinoshita et al. disclose an apparatus exists for sheet-by-sheet cleaning of substrates. Therefore, it would have been obvious to one of ordinary skill in the art to modify Ohmi et al. by specifying a sheet-by-sheet cleaning of a silicon wafer utilizing the processing solution, since it was very well known in the art to clean a wafer in a sheet-by-sheet manner, and further since an apparatus for such a cleaning would have been readily available at the time the current invention was made. *Specifically regarding Claim 2:* Ohmi et al. disclose the processing solution further includes hydrogen peroxide.

6. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ohmi et al. (5,990,060) in view of Kinoshita et al. (5,158,616) as applied to Claim 1 above, and further in view of Ohmi et al. (5,277,835; hereinafter, '835 Patent).

Ohmi et al. (in view of Kinoshita et al.) lack the processing solution further including a surfactant. The '835 Patent teaches a processing solution consisting of an aqueous solution

Art Unit: 2825

which includes hydric fluoride salt and a surfactant (note col. 3, lines 24-30), wherein the surfactant can improve the wettability of buffer hydrogen fluoride (note col. 2, lines 18-27). It would have been obvious to one of ordinary skill in the art to modify Ohmi et al. (in view of Kinoshita et al.) by including a surfactant as taught by the '835 Patent because such a modification would improve the wettability of the processing solution.

7. Claims 9-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohmi et al. (5,990,060) in view of Okutani (5,135,608) and Yokoyama et al. (5,858,863).

*Regarding Claims 9 and 11-15:*

Ohmi et al. disclose (in col. 2, lines 32-34; col. 8, lines 61-62; and TABLE 1) a method of manufacturing a semiconductor integrated circuit device comprising applying a processing solution consisting of an aqueous solution which includes hydric fluoride salt (e.g., ammonium fluoride or tetraalkyl ammonium fluoride "TMAF"). Ohmi et al. lack the following: (1) cleaning a surface of a silicon wafer, in a sheet-by-sheet manner, in said processing solution; (2) forming a thermal gate oxide film; and (3) forming a gate electrode by patterning a conductive film above the gate oxide film. In regards to lacked limitations (2) and (3), processes for forming thermal gate oxide and a conductive gate electrode are/were very well known in the art. Okutani and Yokoyama et al are cited to show that apparatuses for continuous single substrate processing would have been readily available at the time the current invention was made. Okutani teaches (note abstract and Fig. 1) a multi-module apparatus that allows semiconductor device fabrication wherein dry processing and wet processing can be continuously effected without exposing a wafer to the atmosphere, and further wherein a substrate would be singly processed, i.e.,

Art Unit: 2825

processed in sheet-by-sheet manner. Yokoyama et al. also teach a fabrication system that allows for wet and dry processing to be effected, wherein a plurality of processing modules can be utilized in various combinations. Given Okutani and Yokoyama et al., it would have been obvious to one of ordinary skill in the art to modify Ohmi et al. by specifying forming a thermal gate oxide and gate electrode because of the following reasons: (i) Ohmi et al. disclose the claimed processing solution; (ii) Okutani and Yokoyama et al. teach apparatuses were readily available, wherein the processing solution as taught by Ohmi et al. can be readily incorporated; (iii) forming a thermal gate oxide and gate electrode (as instant claimed) are conventional processing steps and the multi-module apparatuses of either Okutani or Yokoyama et al. could be readily used for such conventional processing steps; (iv) therefore, one of ordinary skill in the art would have found it obvious to manufacture a semiconductor device by incorporating the processing solution disclosed by Ohmi et al. into an apparatus as taught by either Okutani or Yokoyama et al., since such an incorporation would allow for wet/dry processing to be performed continuously, in a sheet-by-sheet manner, without exposing the wafer to the atmosphere. *Specifically regarding Claim 14:* The processing solution disclosed by Ohmi et al. contains hydrofluoric acid, therefore, it would have been an obvious matter of design choice for one of ordinary skill in the art to apply said processing solution a second time to clean the surface of the silicon wafer.

*Regarding Claim 10:*

Ohmi et al. disclose the processing solution includes hydrogen peroxide (note TABLE 1).

*Regarding Claim 16:*


Ohmi et al. disclose a step of cleaning the silicon wafer during ultrasonic vibration of the processing solution (note col. 8, lines 62).

***Conclusion***

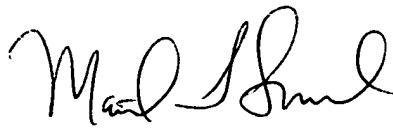
8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Moore et al. (5,402,807), Saga et al. (5,679,171), Lee et al. (5,716,535), Honda et al. (5,780,406), Ohmi et al. (5,858,106), Verhaverbeke (5,972,123), Leon et al. (6,030,932), Kezuka et al. (6,068,788), JP-3-53083, JP-6-41770, and Tsugane et al. (1997 IEEE) are cited to show processing solutions comprising aqueous solutions including hydricid fluoride salt, hydrogen peroxide, hydrofluoric acid, etc.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lex Malsawma whose telephone number is (703) 306-5986. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on (703) 308-1323. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-3431 for regular communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Lex Malsawma 

November 15, 2001

  
MATTHEW SMITH  
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